

returning to the selecting step to be performed using selecting second
values instead of the first values. f.

REMARKS

I. Introduction

Applicants thank the Examiner for the courtesies extended to Applicants' attorney during the telephone interview on May 5, 2002 (the "Interview"). By the foregoing amendment, independent claim 1 has been amended to clarify the subject matter recited therein, in light of the Examiner's comments provided during the Interview. Claims 4 and 27 have been amended to remove minor typographical inconsistencies, and to further clarify the subject matter recited therein. 37 C.F.R. § 1.121. Additionally, claims 5-7 and 14 have been cancelled without prejudice in order to advance the prosecution of this application. New claim 40 has been added. The attached separate pages with these claim changes marked appropriately is captioned as "Version With Markings to Show Changes Made," pursuant to 37 C.F.R. § 1.121. It is respectfully asserted that no new matter has been added.

Accordingly, claims 1-4, 8-13, 15-29 and 40 are now pending in the present application. Reconsideration of the present application based on the foregoing amendments and the following remarks is respectfully requested.

II. Objections / Rejections under 35 U.S.C. § 112 should be withdrawn

Claims 1-29 were objected to or rejected under 35 U.S.C. § 112 as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention. Claims 1, 4 and 27 have been amended to

remove minor informalities referred to in the Final Office Action, but not for any reason of patentability.

In particular, independent claim 1 has been amended to recite the phrase “the boride layer”, which is previously recited in this claim, and to recite a clear relationship between the “surface” introduced in the preamble of claim 1 and the recited layer. Claim 1 has also been amended to include the “step” recitation for the sake of consistency with the recitations of claims 2 and 3.

Claim 4 has been amended to refer to the “glow discharge” recited in claim 1, and to clarify the sequence of the execution of the steps recited in claim 4.

Regarding the rejection of claims 22 and 23, Applicants respectfully assert that the recited units of “hPa” in these claims are well-known units of pressure in the art. The Examiner is referred to the website <http://asd-www.larc.nasa.gov/SCOOL/pressunit.html>, as of May 15, 2003, which defines “hPa - this is hectoPascals, or hundreds of Pascals (newtons per square meter, the metric unit of pressure). See also, e.g., <http://www.met.tamu.edu/class/Metr304/Pressuredir/pressure-pg5.html>, as of May 15, 2003. In light of the foregoing, Applicants respectfully request that the objections/§112 rejections of claims 22 and 23 be withdrawn.

Furthermore, responsive to the Examiner’s remarks, claim 27 has been amended to claim a positive limitation, and is different in scope from claim 26.

III. Rejections under 35 U.S.C. § 103(a) should be withdrawn

Claims 1-11 and 13-29 were finally rejected under 35 U.S.C. § 103(a) as being unpatentable over Canadian Patent No. 2,244,248 to Hunger et al. (hereinafter "Hunger").

Applicants respectfully traverse this rejection.

In order for a claim to be rejected for obviousness under 35 U.S.C. § 103, not only must the prior art teach or suggest each element of the claim, the prior art must also suggest combining the elements in the manner contemplated by the claim. *See Northern Telecom, Inc. v. Datapoint Corp.*, 908 F.2d 931, 934 (Fed. Cir.), cert. denied 111 S.Ct. 296 (1990); *see In re Bond*, 910 F.2d 831, 834 (Fed. Cir. 1990).

Independent claim-1, as amended, relates to a method for producing a boride layer on a surface by plasma boronizing, which comprises the steps of, *inter alia*,

determining an amount of at least one excited boron-releasing gas product in the glow discharge; and

selecting production parameters of the plasma generated in the treatment chamber of the reactor **depending on the determined amount of the excited boron-releasing gas product** so as to maintain at least one of: at least one of a minimum value and a maximum value of the determined excited boron-releasing gas product, and at least one of a minimum value or a maximum value of a relation of one or more of the determined amount of the excited boron-releasing gas product to another glow discharge product to produce the boride layer on the surface.

As indicated to the Examiner during the Interview, in view of the remarks provided on p. 6 of the Final Office Action, Applicants have amended independent claim 1 above to recite that the production parameters are selected depending on the determined amount of excited boron-releasing gas product.

Hunger describes a process for producing wear-resistant boride layers on metal material surfaces using a plasma discharge whereby boron is transferred from the plasma

to the metal surface. (See Hunger, Abstract). The Examiner asserts that “anytime one maintains use of a specific gas mixture...one will inherently produce some minimum and some maximum value of each plasma species created.” (See Final Office Action, p. 6). However, this cannot possibly teach or suggest the limitation recited claim 1 of selecting production parameters to maintain particular properties within the chamber. This is a far cry from the “inherent,” unspecific and unintended production of some minimum and maximum values that is allegedly taught by Hunger.

Moreover, it is stated on page 6 of the Final Office Action that Hunger teaches monitoring and controlling reaction parameters to control and monitor the course of the reaction. However, the cited portion of Hunger, disclosing a “system for controlling and monitoring operating parameters” without any further detail, cannot possibly be said to teach or suggest the limitation above as recited in independent claim 1 for selecting production parameters of the plasma generated in the treatment chamber of the reactor depending on the determined amount of the excited boron-releasing gas product so as to maintain particular properties within the chamber. (See Hunger, p. 5m lines 16-19).

Accordingly, because one or more of the above limitations of claim 1 are not recited in Hunger, the §103(a) rejection of independent claim 1 should be withdrawn. Moreover, regarding the rejections of claims 2, 5, 11, 13, 14, 16 and 17 under 25 U.S.C. §103(a) as being unpatentable over Hunger in view of Canadian Patent No. 2,075,299 by Oppel et al. (hereinafter “Oppel”), Applicants submit that Oppel does not cure the above-mentioned deficiencies of Hunger, nor does the Examiner contend that it does. In fact, as stated in the Final Office Action on p. 8, “Oppel et al. is cumulative to the above Hunger et al, rejection.” Accordingly, because the prior art fails to disclose or suggest at least the

above-referenced limitations recited in amended independent claim 1, Applicants respectfully submit that independent claim 1 is in condition for allowance. Additionally, because all remaining pending claims ultimately depend from claim 1, these claims contain the limitations of independent claim 1 discussed above. Accordingly, Applicants respectfully submit that dependent claims 2-6, 8-11, 13 and 15-29 are also not taught or suggested by Hunger or Oppel, for at least the same reasons as amended independent claim 1.

Additionally, claim 12 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Hunger or Hou, further in view of U.S. Patent No. 5,972,436 to Walthers (hereinafter “Walthers”) or U.S. Patent No. 5,286,534 to Kohler et al. Applicant respectfully traverses this rejection.

As explained above, Hunger in view of Walthers or Kohler fail to teach or suggest one or more limitations recited in independent claim 1. Hou also does not teach or suggest the recited subject matter of claim 1. Claim 12 depends from claim 1, and inherently contains all of the limitations recited therein. Walthers and Kohler also fail to teach or suggest these limitations. Accordingly, Applicants respectfully submit that claim 12 is not taught or suggested by Hunger or Oppel in view of Walthers or Kohler.

IV. Rejections under 35 U.S.C. § 102(b) should be withdrawn

Claims 1-11, 13-16, 18-21 and 24-29 were finally rejected under 35 U.S.C. § 102(b) as being anticipated by Hou. Applicants respectfully traverse these rejections.

In order to render a claim anticipated under 35 U.S.C. § 102, a single prior art reference must disclose each and every element of the claim in exactly the same way.

See Lindeman Machinenfabrik v. Am Hoist and Derrick, 730 F.2d 1452, 1458 (Fed. Cir. 1984).

As discussed above with respect to Hunger and Oppel, Hou also fails to disclose the step of “selecting production parameters of the plasma generated in the treatment chamber of the reactor **depending on the determined amount of the excited boron-releasing gas product.**” For at least this reason, Hou does not teach or suggest the subject matter recited in independent claim 1.

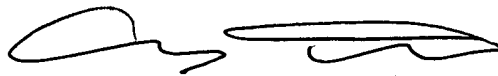
Additionally, it is asserted by the Examiner that Hou implicitly teaches a two stage process, wherein a lower then a higher temperature is used, thus allegedly teaching the limitation of independent claim 1. (See Final Office Action, p. 10-11; citing Hou, col. 5, lines 28-42). The Examiner believes that the coating zone may assume a slightly elevated temperature when compared to the rest of the gaseous atmosphere, because the substrate will be continually heated as it proceeds through the reaction chamber, and accordingly that this additional heat will transfer to the gas immediately surrounding the substrate (See Final Office Action, p. 11). However, as recited in, e.g., claim 4 of this application, by virtue of its dependency from independent claim 1, the recited “gas mixture” does not only include the gas “immediately surrounding” the substrate, but rather the gas mixture which is “suppl[ied]... to a treatment chamber of a reactor,” as recited in claim 1. Accordingly, any incidental temperature variations which may arise in the vicinity of the substrate as allegedly described in Hou cannot possibly teach or suggest that an elevated temperature of the gas is maintained in the treatment chamber of a reactor, as recited in independent claim 1. Accordingly, because the prior art fails to teach or suggest at least these features of the claimed invention, Applicants respectfully

request that these rejections of claims 1-4, 8-11, 13, 18-21 and 24-29 under §102 be withdrawn.

V. Conclusion

In view of the foregoing amendment and remarks, favorable reconsideration and allowance of claims 1-4, 8-13, 15-29 and 40 are respectfully solicited. In the event that the application is not deemed in condition for allowance, the Examiner is invited to contact the undersigned in an effort to advance the prosecution of this application.

Respectfully submitted,



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VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the Claims:

Please cancel claims 5-7 and 14, without prejudice.

Please amend claims 1, 4 and 27, as follows:

1. (Twice Amended) A method for producing a boride layer on a surface by plasma boronizing comprising the steps of:

supplying a gas mixture containing a boron-releasing gas to a treatment chamber of a reactor;

generating a glow discharge in the reactor;

determining an amount of at least one excited boron-releasing gas product in the glow discharge; and

selecting production parameters of the plasma generated in the treatment chamber of the reactor depending on the determined amount of the excited boron-releasing gas product so as to maintain at least one of: at least one of a minimum value and a maximum value of the determined excited boron-releasing gas product, and at least one of a minimum value or a maximum value of a relation of one or more of the determined amount of the excited boron-releasing gas product[s] to another glow discharge product so as to produce [a] the boride layer on the surface.

4. (Twice Amended) The method according to claim 1, further comprising: during a first stage, generating [a] the glow discharge in the reactor while maintaining the gas mixture at a selected treatment temperature [during a first stage] to

first produce said boride layer and prevent formation of halogenides which cause formation of pores, and

during a second stage that is performed after the first stage, [of]
maintaining the gas mixture at a higher temperature than [a previous] the selected
temperature [during in a second stage].

27. (Amended) A method according to claim [26] 1 wherein the [noble gas is argon] gas mixture contains more than 0% and up to 20% by volume of argon and 2% by volume to 50% by volume of boron trihalide, and wherein the remainder of the gas mixture is a hydrogen gas.

Please add new claim 40 as follows:

-- 40. (New) A method for producing a boride layer on a surface by plasma boronizing comprising the steps of:

supplying a gas mixture containing a boron-releasing gas to a treatment chamber of a reactor;

generating a glow discharge in the reactor;

determining a first amount of at least one excited boron-releasing gas product in the glow discharge;

selecting first values for production parameters of the plasma generated in the treatment chamber of the reactor depending on the first determined amount of the excited boron-releasing gas product so as to maintain at least one of: at least one of a minimum value and a maximum value of the excited boron-releasing gas product, and at least one of a minimum value or a maximum value of a relation of one or more of the

amount of the first determined excited boron-releasing gas product to another glow discharge product to produce the boride layer on the surface;

determining a second amount of at least one excited boron-releasing gas product in the glow discharge; and

returning to the selecting step to be performed using selecting second values instead of the first values. --.